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ABSTRACT

Educational technology and the ways in which it is used have undergone considerable changes of the last three decades. Various technology-driven change agents have been responsible for the ways in which this subject has evolved from "chalk and talk" through multimedia to sophisticated virtual reality training environments. Increasingly, educational technology has to be used to support online communities of learners. This paper discusses some of the issues involved. Three broad types of models are identified, needed in order to understand, design and implement learning systems for online users. The first of these relates to the communities of online users for whom the systems are designed; the second relates to the role of technology in society and the ways in which its ongoing development influences the nature of what people do, how they react and the ways in which their goals and ambitions are influenced; and the third type of model concerns the ways in which technology can be used in order to fabricate new types of educational systems and new approaches to teaching and learning. Several electronic communication tools that support the delivery of online courses are described, including electronic mail, list servers, bulletin board systems, and computer conferencing. The relevance of a model of Web-based teaching and learning is illustrated using a case study describing a dynamic online course that involves no face-to-face contact with students. Some of the implications of such courses for online tutors are briefly discussed. (Contains 16 references.) (Author/AEF)

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

CREATING AND SUPPORTING ONLINE LEARNING COMMUNITIES

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Abstract: Educational technology and the ways in which it is used have undergone considerable changes over the last three decades. Various technology-driven 'change agents' have been responsible for the ways in which this subject has evolved from 'chalk and talk' through 'multimedia' to sophisticated virtual reality training environments. Increasingly, educational technology has to be used to support online communities of learners. This paper discusses some of the issues involved and uses a case study to illustrate some of the important techniques that are currently in use.

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Introduction

Many new ways are now becoming available for using computer-based communications technology to distribute and store online information. Such developments necessitate that we critically review the approaches that we employ for the realisation of the basic infrastructures that are used for the support of teaching, training and learning activities. This is especially so with respect to lifelong learning, work-based study, and continuing professional development. With this objective in mind, this paper introduces and discusses a model of teaching and learning that can be used as a basis for building new types of educational infrastructure based upon the use of web-based resources, peer group interaction and online tutoring.

Fundamental to this approach to educational delivery is the creation of an online community of learners involving students, academics, practitioners and subject experts. Members of such a community can interact with each other in both a synchronous and an asynchronous fashion by means of appropriately designed computer conferencing facilities, electronic mail and web-based resources. Naturally, the design and implementation strategies that are used to create and support online learning communities must cater for a variety of different study modes - such as individualised learning and situations that involve collaborative group work. Of course, it is also necessary to ensure that the skills students develop are accredited in appropriate ways using online assessment systems.

Some of the issues involved in designing and implementing online courses have been discussed in detail by Barker (1999a), Barker and Giller (2001), Duchastel (1997), Carr-Chelman and Duchastel (2000) and Ryan et al (2000). There is also a growing volume of literature available electronically through the Internet - both in the form of written publications and contributions to discussion groups. The following section of the paper briefly discusses some of the material that is relevant to the work that is described in this paper.

Some Basic Models

Three broad types of model are needed in order to understand, design and implement learning systems for online users. The first of these relates to the communities of online users for whom the systems are designed; the important issues here are concerned with the ways in which online communities are formed and the ways in which they behave (Preece, 2000). The second type of model relates to the role of technology in society and the ways in which its ongoing development influences the nature of what people do, how they react and the ways in which their goals and ambitions are influenced. The third type of model concerns the ways in which

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technology can be used in order to fabricate new types of educational system and new approaches to teaching and learning. It is this latter type of model which is considered in the remainder of this paper.

The underlying model that we use to design electronic courses for online delivery has been described in detail previously (Barker, 1999b). Essentially, this model depicts the relationships that exist between an online learning community and the four major building blocks used to create an electronic course for such a group of learners. The four essential components that we believe are necessary to build an online course are: (1) the web-based resources that are needed to provide basic course content; (2) an online support infrastructure (tutors and technical help); (3) the communication strategies that underlie course-related online dialogue and student conversations; and (4) the various learning tasks undertaken by students during a given course. The latter may be designed to support skill development activities or assessment procedures. Of course, the tasks that students undertake during their studies will normally involve both individual study activities and group-based working.

In order to support the tasks involved in group-based working it is necessary to have an underlying model that describes the essential features of what is happening. In addition, appropriate tools will also be needed in order to support the basic processes that are involved. The tools that are most often used are described and discussed in the following section; this section therefore concentrates on the underlying model that we use for the support of collaborative learning at a distance.

Some of the important generic models upon which human communication processes depend have been described in detail elsewhere (Barker, 2000). Our model of collaborative online learning, through computer-mediated communication (CMC) techniques, evolves naturally from these. At its centre, the CMC model requires a problem space in which shared objects relating to an online learning activity can be created. The CMC environment must then be able to provide a communication framework that allows two basic functions to be realised. First, learners must be able to communicate with each other with respect to objects existing in the shared problem space; second, they must have available an appropriate repertoire of commands to enable objects in the shared workspace to be manipulated in various ways. Obviously, the power and utility of a CMC environment will depend upon both the nature of the shared workspaces that it supports and the communication/manipulation tools that it provides for its users. This latter issue is discussed in the following section.

Communication Tools

If students are to learn from each other through dialogue and conversation in an online environment then it is imperative that we put into place an appropriate infrastructure to facilitate their communication needs. A variety of different electronic communication tools exist to support the delivery of online courses. Typically, these include electronic mail packages, list servers, bulletin board systems and computer conferencing packages.

Undoubtedly, electronic mail has become one of the most common methods of exchanging messages using computer-based communication networks. Through the use of 'attachments' a wide variety of materials can be exchanged – such as essays, digital photographs, sound clips, video footage and executable programs. Each of these types of medium has a significant educational value in the context of online conversational activity. Although electronic mail is a powerful technique, it has many limitations for use within educational settings, particularly online learning environments. For example, there are no simple mechanisms to allow message threading to reflect the various dialogue strands that might emerge within an online discussion forum. Furthermore, it is not easy to look at message histories in order to identify who has (or has not) read a particular message. There is no control over who submits material and the nature of what is submitted, and so on. For simple online support, electronic mail has many attractions. However, for more sophisticated use it has severe limitations. More powerful CMC tools are therefore needed.

Some of the other important tools that are often used within online learning environments include: a web browser (of course); and programs that facilitate either the transfer of data files between users (such as '*ftp*') or online 'terminal' sessions with remote computers (this is usually accomplished with '*telnet*'). Together, these three basic communication tools form an important 'toolkit' for users of online learning systems. However, as is the case with electronic mail, these tools do not really provide many sophisticated techniques for the support of dialogue processes between groups of students and/or tutors - of course, some browsers such as Internet Explorer (Version 5) do provide a group networking capability.

Computer-conferencing systems represent an example of the type of tool that is now often used to create and support online communities of learners (McConnell, 2000; Harris, 1999). Such tools often provide a wide range of built-in facilities that allow many of the limitations of conventional electronic mail to be overcome. Indeed, used in an appropriate way, alongside a suitably designed teaching web, a CMC system can provide a rich and powerful facility for both student and staff support within an online learning environment. In the case study that is described in the following section, a powerful computer-conferencing facility (SoftArc's *FirstClass* system) is used as a basic building block within the online course that is described.

Both Persico and Manco (2000) and Blanchfield et al (2000) have described some of the ways in which the *FirstClass* system can be used in a teaching and learning environment. These latter authors provide a useful summary of the facilities offered by *FirstClass*. Namely, its ability to allow its users to: send email to and receive email from other users; browse, contribute and subscribe to special mail groups (called 'conferences'); exchange files with other users; and use other features, such as the real-time chat feature. Of course, the system also provides many other 'special' facilities for tutors; these can be used to set up conferences, organise students into tutorial groups and monitor what students are doing.

Naturally, the transition from a conventional teaching and learning environment towards one that is based on online delivery of material (using the types of tool that were described above) has many implications for students, teaching staff and educational organisations. Changes in organisational infrastructure are needed and different types of working practice have to be developed. In addition, the expectations of students are likely to change significantly. Some of the important issues involved in making the transition from a 'chalk and talk' environment to a 'web and email' system have been described and discussed by Duggleby (2000) and Salmon (2000).

Case Study

In this section of the paper the underlying approach that we advocate for the design and creation of online courses will be illustrated by means of a case study involving the delivery of an electronic course that is taught entirely online and which involves no conventional face-to-face contact with students. A description of the basic objectives of the course is given along with a brief outline of how these are realised. The implications of this approach, for future educational systems development, will be briefly discussed. Particular emphasis will be given to the new roles that '*online tutors*' have to play and the nature of the demands that are placed upon them.

The online course that is used in this case study is a UK Open University (OU) foundation level course (*T171*) entitled '*You, Your Computer and the Net*'. The aims of the course are to develop students' understanding of their personal computers (PCs) and the ways in which these can be used as a tool to explore the Internet and facilitate study using the World Wide Web. These aims are realised through the utilisation of: an elegantly designed web structure (*http://t171.open.ac.uk*); a powerful computer-conferencing system (*FirstClass*); a network of online tutors; a collection of skill development tasks; and an automated electronic assessment handling system (*ETMA*). The *T171* course was piloted in 1999 and then made available to students in 2000. The course attracted a record (for the OU) 12,000 students

Essentially, the *T171* course is organised into three main web-based modules. These deal with: [1] the development of both individual online learning skills and group learning in cyberspace (*Module 1: Computing with Confidence*); [2] the history and development of the personal computer (*Module 2: The Story of the PC*); and [3] the Internet and World Wide Web (*Module 3: The Net, Where it Came from and How it Works*). As well as the web-based multimedia materials, there are two set books which students are expected to read. In addition, the course is supported by a set of 15 online '*Study Guides*' that tell students what they should be doing at any particular time. For tutorial support, students are grouped into cohorts of about 20 students; each cohort is then allocated to an online tutor.

During the course there are numerous practical exercises for students to undertake using their computers. Some of these involve individual effort while others require collaborative group working. If students run into difficulty while they are studying or while working on a practical exercise, they can contact their tutor either by electronic mail or by telephone. The skills that students develop as a consequence of studying the *T171* course are assessed using a series of four '*Tutor-Marked Assignments* (TMAs) and an '*End of Course Assessment*' (ECA). There are no formal examinations as such. Students are 'graded' according to their performance in the TMAs and the ECA.

Three of the most important support tools used in the *T171* course (from both a student's and a tutor's perspective) are the *online search engine*, the *FirstClass conferencing package* and the OU's own '*Electronic Tutor-Marked Assignment*' (ETMA) *system*. The search engine allows the whole *T171* web site to be searched (using words and phrases) to locate particular items of interest. The ETMA facility allows students to submit their TMA and ECA materials from their personal computers to a central server at the Open University's main site in Milton Keynes. Subsequently, online tutors can download these materials (from the OU server) to their PCs, mark them and then complete electronic feedback forms. These forms and the marked assignments can then be uploaded from a tutor's PC back to the OU central server for students to collect and inspect.

From a communications perspective, the *FirstClass* (FC) system is undoubtedly the 'mainstay' of the *T171* course. This can be accessed in two basic ways: either using a web browser or by means of software that is installed on its user's PC (this is called *'FC Client'*). Of the two approaches to using *FirstClass*, the latter is by far the most useful since *FC Client* provides far more capabilities - both for students and for tutors - and it can be used in off-line mode. In addition, *FC Client* also supports real-time chat facilities. These can be used to enable groups of students, with or without a tutor, to discuss issues arising from their studies. These discussions take place in 'real-time', that is, while the participants are actually online.

As was mentioned above, the *FirstClass* facility allows various types of conference to be set up - both by the 'course team' and by regional online tutors. The creator of a conference can specify what properties that conference has, who may access it and how it may be accessed (this could involve only reading, reading and writing, and so on). Within any given conference, sub-conferences can be set up so that particular items of importance can be discussed in greater depth. Usually, tutors act as moderators for the conferences that they create - although, sometimes the responsibility for this can be delegated to one or more students within a given 'tutorial group'.

Once a given presentation of the *T171* course is running, tutors involved in that presentation are emailed on a fortnightly basis with instructions about what students should be doing. These regular '*Tutor Guides*' give tutors specific details of the various activities that they have to set up for the students in their tutor group. Throughout the course, each tutor runs a *tutor group conference* to which any student in his/her group can contribute. This main ongoing conference is supported by various other sub-conferences that are set up by tutors in order to provide a forum for discussing and debating issues relating to different parts of the course. As well as tutor group conferences, the *T171* teaching team also sets up a variety of national and regional conferences to which students and staff can contribute.

The *FirstClass* system is also used to provide help and support for the network of online tutors involved in running the course. As an example of this, the '*T171 Teaching Team*' conference contains four sub-conferences entitled '*Tutors Notices*', '*Technical Help*', '*Course Help*' and '*FirstClass Training*'. The '*Tutors*

Notices' conference, in turn, contains two further sub-conferences; these are entitled '*Tutors Resources*' and '*Study Guides*'. These conferences can be used by T171 tutors in order to exchange ideas about the course, swap teaching/tutoring techniques with each other and find solutions to the problems that they encounter. Examples of some of the other online conferences that are available for staff include the '*FirstClass Reference*' and the '*Staff Development*' conferences.

We believe that the case study described in this section of the paper provides a powerful example of the way in which appropriately designed computing resources, Internet facilities and an international team of online tutors can be integrated to produce an effective and scaleable online course. Indeed, we feel that there are many important lessons to be learned from this case study by those others who are involved in designing and producing online courses. These lessons relate both to technical/educational matters and the organisational/logistical issues involved in co-ordinating and synchronising the activities of a large student and staff population in order to create high levels of learning synergy.

Conclusions

The creation of sophisticated electronic courses to support communities of online learners requires the provision and appropriate integration of four basic types of resource. In our opinion the important components that are needed to build a successful online course are as follows. First, an appropriate web structure containing the information that is to be assimilated and/or used as a basis for the course. Second, a range of online communication strategies that allows students to exchange information and converse with each other - and with their online tutors. Third, an appropriate set of problem-based tasks that will facilitate both the development of skills and their accreditation. Fourth, a network of online tutors that can provide help, assistance and motivation for members of the online learning community. Naturally, it is important that these resources are integrated and synchronised in ways that will lead to the derivation of high levels of learning synergy. This paper has introduced a model of web-based teaching and learning which will allow this goal to be achieved. The relevance of the model has been illustrated (using a case study describing a dynamic online course that involves no face-to-face contact with students) and some of the implications of such courses for online tutors have been briefly discussed. This latter issue is discussed and debated in greater depth elsewhere (Barker, 2001).

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